DRYWALL CEILING SUSPENSION CONVENTIONAL CONSTRUCTION – ONE LAYER

IR 25-3

References: California Building Code, Section 2504A, 2511A

Discipline: Structural

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This Interpretation of Regulation (IR) is intended for use by the Division of the State Architect (DSA) staff, and as a resource for design professionals, to promote more uniform statewide criteria for plan review and construction inspection of projects within the jurisdiction of DSA which include State of California public elementary and secondary schools (grades K-12), community colleges, and state-owned or state-leased essential services buildings. This IR indicates an acceptable method for achieving compliance with applicable codes and regulations, although other methods proposed by design professionals may be considered by DSA.

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Purpose: The purpose of this IR is to provide additional guidelines for the design and construction of gypsum wall board suspended ceiling systems.

1. MATERIALS: Materials are to comply with applicable UBC standards. Gypsum board is either 1/2 inch or 5/8 inch in thickness.

2. DESIGN: For lateral load, refer to CBC, Section 1632A. The weight of the suspended ceiling shall not be less than four (4) pounds per square foot for design purposes.

3. DETAILS OF CONSTRUCTION.

3.1 General: Gypboard ceilings should not support building components other than air conditioning/heating grills or light fixtures. All such components shall be supported either directly from main runners, or by supplemental framing which is supported by main runners. No vertical loads other than gypsum board dead load shall be applied to cross-furring.

3.2 Vertical Support System.

3.2.1 There are many possible variations of hanger and main runner sizes and spacings listed in CBC, Table No. 25A-A, and all of the combinations are acceptable. However, the main runners that are most frequently used are 1-1/2 inch cold rolled channels, 0.475 lbs/ft. This is acceptable provided the following requirements are met:

1. Vertical hanger wires are #9 gage and galvanized soft-annealed steel.
2. Cross-furring may be 7/8 inch, 25 gage galvanized hat sections at 24 inches o.c. maximum.
3. If main runners are spaced at 4'-0" o.c., hanger wires shall be spaced at 3'-0" o.c. maximum.

   If main runners are spaced at 3'-6" o.c., hanger wires shall be spaced at 3'-6" o.c. maximum.

   If main runners are spaced at 3'-0" o.c., hanger wires shall be spaced at 4'-0" o.c. maximum.

To use a main runner spacing of 4'-0" o.c. with a hanger spacing of 4'-0" o.c., main runners must be 1-1/2 inch hot rolled channels weighing 1.12 lbs/ft. Also, #8 gage galvanized hanger wires would be required.

3.2.2 The following requirements apply to all wire hanger/runner combinations:

1. Hangers should be saddle-tied around main runners to develop the full strength of the hangers.
2. Cross-furring should be saddle-tied to the main runners with one strand of #16 gage, or two strands of #18 gage tie wire.
3. Main runners should be spliced by lapping and interlocking flanges 12 inches minimum and tying near each end with double loops of #16 gage wire.
4. Cross-furring should be spliced by lapping and interlocking the pieces eight (8) inches minimum and tying near each end with double loops of #16 gage wire

3.2.3 Fasten hanger wires with not less than three (3) tight turns. Fasten bracing wires with four (4) tight turns. Make all tight turns within a distance of 1-1/2 inches. Hanger or bracing wire anchors to the structure should be installed in such a manner that the direction of the anchor aligns as closely as possible with the direction of the wire.

Note: Wire turns made by machine where both strands have been deformed or bent in wrapping can waive the 1-1/2 inch requirement, but the number of turns should be maintained, and be as tight as possible.

Separate all ceiling hanger and bracing wires at least six (6) inches from all unbraced ducts, pipes, conduit, etc. ←

When drilled-in concrete anchors or shot-in anchors are used in reinforced concrete for hanger wires, 1 out of 10 must be field tested for 200 lbs. in tension. When drilled-in concrete anchors are used for bracing wires, 1 out of 2 must be field tested for 440 lbs in tension. Shot-in anchors in concrete are not permitted for bracing wires. If any shot-in or drilled-in anchor fails, see Section 1923A.3.5, Title 24. ←

Note: Drilled-in or shot-in anchors require special DSA approval when used in prestressed concrete.

Provide trapeze or other supplementary support members at obstructions to typical hanger spacing. Provide additional hangers, struts or braces as required at all ceiling breaks, soffits or discontinuous areas. Hanger wires that are more than 1 in 6 out of plumb are to have counter-sloping wires.

4. SUPPORT AND ANCHORAGE OF LIGHT FIXTURES AND MECHANICAL SERVICES.

4.1 All recessed or drop-in light fixtures, as well as ceiling mounted mechanical air terminals and services, shall be supported directly by main runners or by supplemental framing which is supported by main runners and positively attached with screws or other approved connectors.

4.2 Surface mounted fixtures shall be attached to a main runner with a positive clamping device made of material with a minimum of 14 gage. Rotational spring clamps do not comply.

5. LATERAL SYSTEM:

5.1 Wire Brace System. Provide bracing assemblies, per Figure 1 of IR 25-2, as determined by calculations, with the following limitations:

1. For school buildings, place bracing assemblies at a spacing not more than 12 ft. by 12 ft. on center.
2. For Essential Services Buildings, place bracing assemblies not more than 8 ft. by 12 ft. on center.
3. Provide bracing assemblies at not more than six (6) feet from each perimeter wall and at the edge of vertical ceiling offsets.

   The slope of bracing wires shall not exceed 45 degrees from the plane of the ceiling and shall be taut. Splices in bracing wires are not to be permitted without special DSA approval.
4. Ceiling grid members may be attached to not more than two (2) adjacent walls. Ceiling grid members shall be at least 1/2 inch free of other walls. If walls run diagonally to ceiling grid system runners, one end of main and cross runners should be free, and a minimum of 1/2 inch clear of wall.
5. Suspended ceiling systems with an area of 144 square feet or less, and fire rated ceiling systems with an area of 96 square feet or less, surrounded by walls which connect directly to the structure above, do not require bracing assemblies when attached to at least two adjacent walls.

5.2 Alternate System: Design as a diaphragm, similar to plywood diaphragm concept, subject to acceptance by the DSA Regional Office.

5.2.1 Diaphragm Ratios:

Horizontal 2:1 maximum

Vertical 1:1 maximum

5.2.2 A maximum diaphragm shear equal to 50 lbs./ft. is allowed with 1 inch or 1-1/4 inch Hi-Lo Type S, or S-12, bugle head screws at 12 inches o.c. at all gypsum board edges (3/8 inch screw edge distance) and at all intermediate supports. A wall constructed similarly can resist the same shear force provided the gypsum board is on the same side of the studs as the ceiling is, and a positive connection between the ceiling and the wall is detailed. The gypsum board diaphragms are to resist lateral loads due to their own weight and/or the ceiling diaphragm(s) only.

5.2.3 Details are required providing for lateral load transfer from the gypsum board to shear walls, or other lateral load resisting elements, on all four sides of the diaphragm.